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## **ARTICLES AND METHODS FOR APPLYING COLOR ON SURFACES**

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### **FIELD OF THE INVENTION**

The present invention is directed to articles and methods for applying color on a surface, for example an architectural surface, wherein a dry color component is employed and the use of wet tools such as brushes, sprayers and rollers, mess protection, color component cleaning materials and liquid volatile organic components for the color components may be avoided.

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### **BACKGROUND OF THE INVENTION**

It is often desirable to apply one or more colors to a surface, for example an architectural surface such as an interior or exterior wall or the like, for aesthetic benefits and/or functional benefits such as water resistance. Color is typically provided by conventional painting with water-based or oil-based wet paints, application of wallpaper or the like. The laborious processes involved with wet painting and wall papering are well known. Typically, it is necessary to protect surrounding areas from collateral mess during such activities by taping adjacent surfaces where the color is not desired, arranging drop clothes to protect floors and furniture, and the like. Extreme care must also be exercised to avoid dripping of paint, wallpaper paste or primer, or other wet-applied materials. Many wet paint and wall paper products are also recommended for use together with one or more primers or bases to assist in coverage and/or durability of the desired color, thereby increasing the time and labor for producing a desired color effect on such a surface. Additionally, it is typically necessary to saturate brushes, rollers or other applicators with paint, primer, paste or the like in order to apply the material to a

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surface. As a result, a significant amount of material is wasted, as it never reaches the intended surface, but remains on the applicator. Cleaning of brushes, sprayers, rollers and other tools used in application of wet paint and wall paper once painting or wall papering is completed, or at least suspended for a period of time, such as overnight, is also time consuming.

Many paints adapted for application to surfaces such as architectural surfaces include one or more volatile organic compounds. Such paints release noxious fumes during and after application, thereby requiring ventilation during and after application, particularly in closed environments such as buildings.

Thus, in spite of the obvious aesthetic and/or functional benefits provided by applying color on a surface by wet painting or wall papering, the efforts required in connection with such procedures are inconvenient and time consuming.

### **SUMMARY OF THE INVENTION**

Accordingly, it is an object of the invention to provide articles and methods for applying color on a surface, for example an architectural surface, which overcome various disadvantages commonly associated with conventional wet painting and/or wall papering procedures.

In one aspect, the invention is directed to articles for applying color on a surface. In a first embodiment, the invention is directed to an article for applying color on a surface, which article comprises a sheet of dry architectural surface color component, an adhesive on one surface of the sheet of dry color component, and a releasable liner, wherein the sheet of dry color component is arranged between the releasable liner and the adhesive, wherein the adhesive is adapted to adhere the article to a surface at room temperature and upon application of a pressure of less than about 50 lb/in<sup>2</sup>, and wherein the article exhibits an elongation of less than 50%.

In another embodiment, the invention is directed to an article for applying color on a surface, which article comprises a sheet of dry color component, an adhesive on one surface of the sheet of dry color component, and a releasable liner, wherein the sheet of dry color component is arranged between the releasable liner and the adhesive, and wherein the adhesive is adapted to exhibit an initial tack in response to a first condition

and a subsequent tack greater than the initial tack in response to a second condition. The subsequent tack is adapted to provide a substantially permanent bond of the sheet of dry color component to a surface.

5 In a further embodiment, the invention is directed to articles for applying color on a surface, comprising a sheet of dry color component and an adhesive on one surface of the sheet of dry color component. The sheet of dry color component and the adhesive are adapted to provide a surface covering having a water vapor transmission rate of at least 1 g/ $\mu\text{m}/\text{cm}^2/24$  hrs.

10 In yet a further embodiment, the invention is directed articles for applying color on a surface, comprising a sheet of dry color component and an adhesive on one surface of the sheet of dry color component. The sheet of dry color component exhibits a specular reflectance of less than about 60 glass units at 60°.

In another aspect, the invention is directed to methods for providing a substantially permanent color effect on an architectural surface. In one embodiment, the methods comprise delivering an article according to one of the embodiments described above to the architectural surface.

20 The articles and methods of the invention are advantageous in that color may be applied on a surface without requiring the use of wet tools such as brushes, sprayers and rollers for delivery of the articles or application of the dry color component, mess protection, or color component cleaning materials, and the dry color component is substantially free of volatile organic components. The articles and methods are further advantageous in that color may be applied on a surface in a less time-consuming manner as compared with typical wet painting and/or wall papering products and methods. These and additional objects and advantages will be more fully apparent in view of the following detailed description.

### **BRIEF DESCRIPTION OF THE DRAWING**

The following detailed description will be more fully understood in view of the drawings in which:

30 Fig. 1 sets forth a schematic diagram of one embodiment of an article for applying color on a surface according to the present invention;

Fig. 1A sets forth a schematic diagram of an article as set forth in Fig. 1, including a reinforcing component;

Fig. 1B sets forth a schematic diagram of an article as set forth in Fig. 1, wherein the sheet of dry color component includes an additional protective film layer;

5 Fig. 2 sets forth a schematic diagram of another embodiment of an article for applying color on a surface according to the present invention;

Fig. 2A sets forth a schematic diagram of another embodiment of an article for applying color on a surface according to the present invention;

10 Fig. 3 sets forth a schematic diagram of another embodiment of an article for applying color on a surface according to the present invention; and

Fig. 4 sets forth a schematic diagram of one process for producing an article for applying color on a surface according to the present invention.

The embodiments set forth in the drawing are illustrative in nature and are not intended to be limiting of the invention defined by the claims. Moreover, individual  
15 features of the drawing and the invention will be more fully apparent and understood in view of the detailed description.

### **DETAILED DESCRIPTION**

The present invention is directed to articles and methods for applying color on a  
20 surface. As employed herein, the term "color" is used to refer to a color effect, i.e., a difference in color perception. In a specific embodiment, the color effect is a substantially permanent color effect, i.e., a color effect which is not removed or noticeably reduced upon casual contact, light washing, or the like. Thus, a substantially permanent color effect is distinguished from a temporary color effect which can be easily  
25 removed or reduced, such as that provided by chalk or crayons. The term "color component" is used herein to refer to the component of the inventive articles which provides the color effect. Exemplary color components will be described in further detail below.

The term "surface" is used herein to refer to any outer layer or boundary of an  
30 object or substrate which is capable of receiving a color component thereon. Suitable surfaces may be substantially two-dimensional and flat or substantially three-dimensional

and including curves, angled portions or the like. In one embodiment, the surface to which color component is applied using the articles and methods of the invention comprises an architectural surface, i.e., a surface of a building, a building fixture (i.e., appliances), furniture, and the like. The architectural building surface may be an interior surface within the building or an exterior surface on an outer portion of the building. Substantially three-dimensional architectural surfaces can include, for example, edge treatments of two-dimensional surfaces such as moldings (e.g., moldings around windows or doorways), floorboards, appliances, furniture, and the like. The architectural surface may be permanently installed or may be temporarily installed or portable. The products of the present invention can further be applied to surfaces of articles to give them the same or different texture and/or appearance of architectural surfaces. For example, the products hereof can be used to apply a color layer to appliances, furniture, and other architectural articles. Additional surfaces suitable for application of color using the articles and methods of the present invention will be apparent to those skilled in the art in view of the present disclosure.

The term "wet" is used herein to refer to an article or process step which employs a liquid carrier. On the other hand, the term "dry" is used herein to refer to an article or process step substantially free of a liquid carrier such that immobilization of a color component is affected, i.e., the color component does not flow or move along the surface under ambient conditions. Thus, a dry color component is substantially free of a liquid carrier or vehicle, whereby the color component is physically immobilized in the article in which it is included. Similarly, reference herein to delivery of a dry color component without the use of liquid vehicles or carriers refers to the dry color component substantially free of liquid vehicle or carrier such that the color component is physically immobilized in the article in which it is included.

Thus, the dry color component employed in the articles of the present invention is substantially free of volatile organic components (VOC's) and water. According to standards of the Environmental Protection Agency, architectural coatings containing less than 250 g/l of volatile organic components are substantially free of such components. In selected embodiments of the present invention, the dry color component contains less than 250 g/l, more specifically about 200 g/l or less, more specifically about 100 g/l or

less, and even more specifically about 50 g/l or less of volatile organic components. In further embodiments, the dry color component contains about 25 g/l or less volatile organic components, and more specifically about 20 g/l or less volatile organic components. In further embodiments, the dry color component similarly contains less than 250 g/l, more specifically about 200 g/l or less, and even more specifically about 100 g/l or less of water. In more specific embodiments, the dry color component contains about 50 g/l or less of water, and more specifically, about 25 g/l or less, more specifically about 20 g/l or less of water.

As will be discussed in further detail below, the articles and methods for applying color on a surface according to the present invention exhibit a number of advantageous properties. For example, the articles and methods of the invention are adapted for color application at room temperature and at relatively low application pressures, whereby the articles may be applied by ordinary consumers without the use of excessive pressure. Additionally, various surface effects can be provided.

The articles and methods may be employed to provide a porous surface covering which allows air to escape as the article is applied to a surface, thereby avoiding bubbles and/or wrinkles from appearing on a covered surface. In certain embodiments, the surface covering which is provided is microporous and therefore allows moisture to escape rather than accumulating between the applied article and a surface to which it is applied. For example, the surface coverings provided by the articles and methods according to the present invention may exhibit a water vapor transmission rate (WVTR) of greater than about 1 g- $\mu$ m/cm<sup>2</sup>/24 hrs, more specifically, greater than about 4 g- $\mu$ m/cm<sup>2</sup>/24 hrs, at 100% relative humidity and 40°C, as measured according to ASTM F1249-90. The desired WVTR may be provided through the use of materials which inherently allow water vapor transmission and/or by providing pores, perforations, orifices or the like in the articles, either on a micro or macro scale. These and additional advantageous properties provided by the articles and methods of the invention will be further described hereafter.

Fig. 1 sets forth a schematic diagram of one embodiment of the articles according to the present invention. With reference to Fig. 1, the article 10 for applying color on a surface comprises a sheet 12 of dry color component and an adhesive 14 on one surface



16 of the sheet 12 of dry color component. The sheet 12 is shown as a single layer of dry color component. While the schematic diagram of Fig. 1 shows relative thicknesses of the sheet 12 and the adhesive 14, the illustrated thicknesses provide no representation or limitation of actual thicknesses of the respective components in the embodiment of Fig. 1 or in any of the embodiments of the remaining Figures. Additionally, while the interface between the components is shown as a clearly defined line, the actual interface between components may comprise other, different configurations.

As employed herein, the term "sheet of dry color component" is intended to refer to those portions of the inventive article which contribute to the color effect rendered to a surface, but does not include a releasable liner or other portions of the article which are not adapted for adherence, preferably substantially permanent adherence as described hereafter, to a surface to render the color effect. Thus, as will be described in further detail below, the sheet of dry color component may include not only a dry color component layer as shown in Fig. 1 but, in addition, one or more topcoat layers and/or one or more backing layers which contribute to the color effect.

Typically, the sheet of dry color component will have a thickness of less than about 0.003 inch (3 mils or 0.08 mm). In one embodiment, the sheet of dry color component will have a thickness of from about 0.0003 inch (0.3 mils) to about 0.003 inch (about 0.008 mm to about 0.08 mm), more specifically from about 0.0003 inch to about 0.0015 inch (about 0.008 mm to about 0.04 mm). In another embodiment, the sheet of dry color component will have a thickness about 0.0007 inch (0.02 mm) or less, and even more specifically not more than about 0.0005 inch (0.013 mm).

In embodiments wherein the article comprises the sheet of dry color component and adhesive, in the absence of layers such as liners or carriers, the thickness of the articles will be essentially that of the sheet of dry color component, as the adhesive layer is typically relatively thin, i.e., generally less than about 1 mil (0.001 inch or 0.03 mm) in thickness, more specifically about 0.5 mil (0.0005 inch or 0.013 mm) in thickness. Thus, in one embodiment, the sheet of dry color component and adhesive combined have a thickness of about 0.003 inch (3 mils or 0.08 mm) or less, more specifically from about 0.0003 inch to about 0.003 inch (about 0.008 mm to about 0.08 mm), even more specifically from about 0.0003 to about 0.0015 inch (about 0.008 mm to about 0.04mm),

and yet more specifically about 0.0007 inch (0.013 mm) or less. Advantageously, edges of adjacent sheets may thus be overlapped without significant overlap appearance. In further embodiments wherein one or more releasable liners are included, the thickness of the articles will be increased.

5           The dry color component is provided in at least one layer in the sheet of dry color component and may comprise any composition which provides opacity coverage to a surface to which it is applied. The dry color component may comprise, for example, pigment or dye, as well as combinations thereof; and a binder. Stains, inks, and paints are examples of compositions that may contain pigment and/or dye in combination with  
10 binder. Examples of dry color components include inks, stains, paints, and coatings similar to "wet" compositions, except for their being characterized by having low levels of solvent, liquid carrier, and other liquids as hereinbefore described. The binder can be a polymeric material that forms a coating, sheet, or film. A wide variety of binder materials are well known in the art and can be used in the present invention. Suitable binder  
15 materials are disclosed, for example, in the Enlow et al U.S. Patent No. 6,336,998. Suitable binder materials can include the same polymeric materials described below for use as topcoats. Examples of binder materials also include polystyrene and polyacrylate/polyvinyl chloride blends. The sheet of dry color component can constitute a dry color component coating layer applied to another layer that is intended to remain on  
20 the surface to be colored, as described herein, or, alternatively, the sheet of dry color component may constitute a dry color component layer with sufficient integrity such that another layer is not required therein for substantially permanent application to the surface to be colored.

          In one embodiment, the dry color component comprises a combination of (i) dry  
25 pigment and/or dye and (ii) binder, alone or in combination with additional components. For example, in specific embodiments, the dry color component comprises dry paint, which includes pigment in combination with additional conventional paint components, for example binder, from which a liquid carrier is removed, dry ink, which typically includes fine pigment or dyes, alone or in combination with additional conventional ink  
30 components, including opacifying agents, from which a liquid carrier is removed, dry stain, dry ink, or a combination of two or more of these components. The sheet of dry

color component may comprise a single, solid homogenous color with a smooth finish or with a textured finish or may comprise regular or irregular patterns of two or more color components, and/or layers of color components. The sheet of dry color component may have a flat, eggshell, satin, semi-gloss, or gloss finish, as desired. The particular finish  
5 may be controlled by selection of color components and/or by selection of a releasable liner of suitable finish, if employed. Texture may be added either within the layer of dry color component, through a releasable liner, and/or through an adhesive layer, depending on the desired effect. The articles of the present invention are particularly advantageous for delivering a faux finish to a surface in a single application step. Faux finishes are well  
10 known in the art and generally provide a non-homogeneous decorative effect, examples of which include, but are not limited to, marbleizing, mottling, stippling, streaking, ragging and the like. In one embodiment, the dry color component is provided in a noncontinuous or continuous, repeating or non-repeating pattern to provide a stencil-like effect on a surface.

15 The dry color component may exhibit gloss characteristics as desired. In one embodiment of the invention, the dry color component exhibits gloss characteristic of conventional architectural paints, such as flat, eggshell, satin, semi-gloss or gloss finishes, as desired. One of ordinary skill in the art will appreciate the difference between such finishes and high-gloss finishes such as are employed in, for example, the automotive  
20 industry. Gloss may be measured by specular reflectance of a beam of light at an angle of 60°. Typically, the specular reflectance for the sheet of dry color component of the present invention is less than about 60 gloss units at 60°. Specular reflectance may be measured using the test method described in GM Test Specification TM-204-A. The Byk-Mallinckrodt "multi-gloss" or "single gloss" gloss meters can be used for measuring  
25 specular gloss of the finished surface. Those gloss meters give values equivalent to those obtained from ASTM Method D-523-57. Either gloss meter is used with gloss standards covering the expected range of measurement, together with a piece of polished black glass plate of known refractive index. The gloss meter is calibrated by setting it to read the gloss of a highly polished standard and then reading the gloss of a working standard  
30 having a value preferably in the range of the test panel. The second standard should agree within one unit of its assigned value. At least two readings are taken on a different area

of the test panel. These values are averaged if they agree within one unit. If the range is larger than one unit, additional regions are taken and a mean value is calculated. Desired gloss characteristics may be obtained by use of particles included in the dry color component sheet, a topcoat layer, post-treatment, texturization or the like in accordance with techniques known in the art.

Another benefit of low gloss surfaces is a reduced need for surface preparation prior to future applications of surface treatments that may be desired to change color and/or appearance, or prior to refinishing the surface with a fresh application of color treatment. In particular, high gloss surfaces, in general, tend to require roughness to be imparted to ensure good results when painting or applying other treatments to the surface.

In specific embodiments, the sheet of dry color component comprises two or more layers, at least one of which contains a color component to provide a desired color effect. Additional layers may comprise a topcoat, for example comprising a transparent, translucent, pearlescent or opaque coating, for example providing a gloss, semi-gloss, satin, eggshell, or flat sheen or other optical effects such as diffusion, reflectance or the like, or other beneficial properties, a white backing layer to provide intensity and/or consistency, an opacifying layer, or the like, and combinations thereof. Another benefit of such additional layers is that they can provide increased strength and/or flexibility to the sheet.

In a specific embodiment, the dry color component comprises a dry architectural surface color component, i.e., a color component particularly adapted for application to an architectural surface. Such dry color components typically exclude color components requiring not only conventional drying but an additional curing step, for example, a high temperature curing step, the addition of a reactive curing agent therein or the like. Thus, in one embodiment, the dry architectural surface color component is substantially free of cyanate curing agents, (meth)acrylate curing agents and cyanate-(meth)acrylate curing agents typically employed in curable enamel paints, whereby the color component contains any such curing agents therein in an amount which is less than that required to effect measurable crosslinking of the color component. In more specific embodiments, any such curing agents are contained in the color component in an amount less than about 0.0004% by weight.

As the dry color component is adapted to be applied to a surface in a dry state, the sheet of dry color component is produced at a manufacturing location. The sheet of dry colorant may be formed using latex compositions, water-dispersible compositions, solvent-based compositions, ultraviolet curable compositions, or the like. As the sheet is produced at a manufacturing location, paint drying or curing is affected within the manufacturing process and volatile organic components or other byproducts from the compositions may be captured in the manufacturing process. In one embodiment, these byproducts may be reclaimed or recycled as part of the manufacturing process.

The articles provide good opacity and coverage by application of a single sheet of dry color component, providing consumers with cost and time benefits. Preferably the articles exhibit an opacity index of at least about 0.95 as measured according to ASTM D2805. Typically, in such measurements, the article is carefully applied on a test surface, for example the surface of a color contrast card such as a Leneta opacity form 2A, avoiding bubbles and wrinkles. In more specific embodiments, the articles exhibit an opacity index of at least about 0.98, and more specifically at least about 0.995 as measured according to ASTM D2805. Substantially complete coverage, i.e., full hide, may be obtained even over dark surfaces, stained surfaces and the like. If desired, one or more layers or components of the article may include an additional opacifying agent, for example one or more metals, metal oxides, minerals, or the like, or a combination thereof, to improve the opacity of the article. Examples of such opacifying agents include, but are not limited to, titanium dioxide, carbon black, and the like. Suitable opacifying agents may be provided as clusters, powders, flakes, particles, or groupings of particles such as aggregates or agglomerates, or the like. Flakes having a minimum dimension of at least 0.02 microns and an aspect ratio of about 100 to 1000 are desirable. Particles, for example, titanium dioxide particles, that impart good opacification preferably have a dimension in the range of about 0.15 to 150 microns and more preferably from about 0.20 to 50 microns. While the opacifying agent may be provided in the sheet of dry color component, in alternative embodiments, the opacifying agent, if employed, may be included in the adhesive or a backing layer, or in one or more other layers as desired. While not wishing to be bound by theory, it is believed that many household stains, particularly oil-based stains, exhibit reduced surface energy and tend to repel wet paint,

particularly water-based wet paints, thereby making stains difficult to cover and often requiring additional pretreatment steps. Wet water-based paints can also cause flash rusting when water migrates from the paint to nail heads and the like. However, the dry color component sheets of the present invention are substantially free of a liquid carrier, whereby the aforementioned problems associated with liquid carriers are avoided. Advantageously, stains can often be covered without pretreatment of the stained surface.

The dry color component advantageously exhibits a minimum level of elasticity sufficient to allow bending, rolling, or similar manipulations of the sheets without causing cracking, breaking or other damage to continuous areas of dry color component.

In one embodiment, the articles of the invention also exhibit less than 50% elongation when measured according to ASTM D882 using a 1.0 inch (2.54 cm) wide sample and a 2.0 inch gauge length at a crosshead speed of 20 in/min (50.8 cm/min). Generally, elongation is measured at room temperature which, as used herein, refers to temperatures less than about 100°F (38°C). Typically, the elongation as described above is exhibited at temperatures of from about 40°F (4°C) to about 95°F (35°C), more specifically at about 60°F (15°C) to about 80°F (27°C). In further embodiments, the articles exhibit 25% or less elongation, according to ASTM D882 as described.

The sheet of dry color component may also exhibit sufficient conformability to adapt to the form of the surface to be colored. In addition, the sheet of dry color component may be sufficiently conformable to allow the articles to be easily manipulated around and/or into corners and other three-dimensional configurations. Further, the sheet of the dry color component may be microconformable. As used herein, microconformability refers to the ability of the articles to become similar in form or character to the surface to which they are adhered, whereby, upon application, the sheet of dry color component will closely mimic the texture of the underlying surface to provide a paint-like appearance. The conformability and microconformability are preferably exhibited at room temperature as defined above.

In the embodiment shown in Fig. 1, the article 10 for applying color on a surface is free of a releasable liner and is free of a carrier sheet. As used herein, the term "releasable liner" is generally used to refer to a sheet which is removable and is intended and adapted for removal shortly before or upon application of the sheet of dry color

component to the desired surface. On the other hand, as used herein, carrier sheet is used to refer to a sheet which is intended and adapted for application to a surface, typically between the surface and a layer providing a decorative effect, to provide structural support. A common carrier comprises, for example, a wallpaper backing sheet. Carrier layers are typically significantly greater than 3 mils (0.08 mm) in thickness and therefore are significantly distinguishable from the sheet of dry color component and the articles of the present invention. Thus, in the embodiment of Fig. 1, neither a carrier sheet nor a releasable liner is employed. In a further embodiment, the article is free of cellulosic materials, particularly cellulosic substrates commonly employed in wallpaper carrier layers. In a more specific embodiment, the article 10 consists essentially of the sheet 12 of dry color component and the adhesive 14 on the surface 16 of the sheet 12 and does not include any other component which would materially affect the use or properties of the article.

In another embodiment, the sheet 12 of dry color component comprises a reinforcing component. The reinforcing component may be used to provide strength or structural integrity to the sheet material and/or to provide the sheet material with increased thickness or body to facilitate handling and/or use of the article. Other advantages resulting from the use of a reinforcing component will be apparent in view of the present disclosure. The reinforcing component may comprise any additive which achieves one or more of the intended reinforcing benefits. Preferably, the reinforcing component does not disadvantageously alter the rheology of the sheet of dry color component, whereby the sheet exhibits sufficient elasticity to allow bending, rolling and the like without causing cracking or other damage to the dry color component sheet. Examples of suitable reinforcing components include, but are not limited to, filaments, fibers, films, nonwovens, scrim, threads, sheets and the like, or a combination thereof, and may be formed of any suitable material, including polymers, metals, cellulosic materials, glass, ceramics, and the like. The reinforcing component is distinguishable from a carrier sheet or layer as the reinforcing component is provided within the sheet of dry colorant and is not adapted or intended for arrangement between the sheet of dry colorant and a wall surface. In contrast, a carrier sheet, as noted above, is intended and

adapted for application to a surface between the surface and a layer providing a color effect, such as in wall paper.

The reinforcing component may be provided in the sheet 12 in a patterned manner, for example, as a thinly woven structure, or in a non-patterned, non-woven manner, using any desirable technique, for example casting, mixing, coating or spraying. In one embodiment, the reinforcing component will be of a sufficiently small dimension so as to not provide an undesirable irregular surface when the sheet of dry color component is applied to the surface for which a color benefit is desired. For example, in such embodiments, suitable reinforcing components should have a thickness dimension not greater than about 75% of the thickness of the sheet of dry color component. In alternate embodiments, the reinforcing component may be of sufficient thickness to provide surface texturing of the sheet of dry color component. Fig. 1A shows an article 10A comprising a sheet 12A of dry color component and an adhesive 14A. The sheet 12A comprises a reinforcing component 11 and layers 13 of dry color component.

Adhesive, as used herein, refers to a substance which is adapted to adhere the article of the invention to a surface at room temperature which, as used herein, generally refers to temperatures less than about 100°F (38°C). Typically, for use on architectural surfaces, the adhesive will exhibit the required adhering effect at temperatures in a range of from about 40°F (4°C) to about 95°F (35°C). Additionally, the adhesive exhibits its adhering effect at low application pressures, thereby allowing application and adherence of the articles of the invention to a surface to be colored by hand or with simple tools. In one embodiment, the adhesive is adapted to adhere the article to a surface to be colored by application of a pressure of less than about 50 lb/in<sup>2</sup> (3.5 kg/m<sup>2</sup>) more specifically less than about 30 lb/in<sup>2</sup> (2.1 kg/m<sup>2</sup>), and even more specifically less than about 20 lb/in<sup>2</sup> (1.4 kg/m<sup>2</sup>). In a further embodiment, the adhesive is adapted to adhere the article to a surface to be colored by application of a pressure of from about 3 lb/in<sup>2</sup> (0.21 kg/m<sup>2</sup>) to about 10 lb/in<sup>2</sup> (0.7 kg/m<sup>2</sup>).

In Fig. 1, the adhesive 14 is illustrated as a layer on the surface 16 of the sheet 12. The adhesive may be provided in layer form as illustrated, or may be provided in any continuous or non-continuous configuration as desired. The adhesive serves to adhere the sheet of dry color component to the surface to be colored. Preferably, the adhesive is of a



character and is provided in an amount to allow repositioning of the article when the article is initially applied to a surface, such that the sheet of dry color component may be temporarily adhered to a surface to be colored and, if improperly positioned, may be repositioned or even removed from the surface and reapplied for proper positioning, and  
5 such that once proper positioning of the sheet of dry color component has been obtained, the sheet of dry color component may be permanently adhered to the surface. Thus, in one embodiment, the adhesive is adapted to exhibit an initial tack in response to a first condition and a subsequent tack greater than the initial tack in response to a second condition.

10 An initial low tack suitable to allow repositioning is about 100 grams/inch or less, more preferably in the range of from about 25 grams/inch to about 50 grams/inch, as measured in a 180° angle peel test using a 1.0 inch wide peel strip according to ASTM D3330 and/or PSTC-1. The subsequent tack is greater than the initial tack and in a specific embodiment provides a substantially permanent adhesion or bond between the  
15 sheet of dry color component and the surface.

In one embodiment, the first condition may comprise a first application pressure which causes the adhesive to exhibit the initial tack, while the second condition may comprise a second, greater application pressure which causes the adhesive to exhibit a second greater tack. In an alternate embodiment, the first condition may comprise a first  
20 period of time after application of the article to a surface, during which period of time the adhesive exhibits a level of tack allowing repositioning, and the second condition is the period of time occurring after expiration of the first period of time, i.e., a "second period of time". After the first period of time, the adhesive exhibits a level of tack that inhibits or prevents repositioning. The period of time during which the tack increases from a  
25 repositionable level to the substantially permanent level is a matter of choice that can be designed into the product by selection of adhesive, in accordance with ordinary skill in the adhesive art. In certain embodiments, the first time period will be from about 2 hours to about 24 hours. Thus, in this embodiment, the adhesive may be provided such that the article is positioned on and adhered to a surface using a single pressure, applied by hand  
30 or with a simple applicator tool, and the permanence of the adhesive tack increases over time once the article has been applied on a surface.

The adhesive component of the articles of the invention is a dry adhesive, i.e., an adhesive which is substantially free of a liquid carrier such that it is immobilized on the sheet of dry color component and does not drip therefrom. Exemplary, but non-limiting adhesives include hot melt-, pressure sensitive-, water based-, water borne-, solvent based-, ultraviolet- and e-beam cured adhesives, and combinations thereof. In one embodiment, the adhesive comprises a pressure sensitive adhesive, for example, hot melt pressure sensitive adhesive, or water-based or -borne pressure sensitive adhesive, for example a liquid emulsion pressure sensitive adhesive, which may be applied to a sheet of color component and then dried to provide the articles of the present invention.

10 Alternatively, the adhesive may be a static adhesive, for example an electrostatic adhesive. It is preferred that the adhesive cause the sheet of dry paint and the substrate to have a final bond strength of greater than about 100 grams/in, more specifically greater than about 150 grams/in, and even more specifically greater than about 200 grams/in, as measured according to ASTM D3330 as described above using a 1 inch wide peel strip.

15 While the adhesive may allow initial repositioning of the sheet of dry color component, the adhesive preferably provides an at least substantially permanent bond between the dry color component and the surface to which the color effect is provided upon completion of the application process and curing of the adhesive. A substantially permanent bond is one that is not broken upon casual contact, light washing or the like.

20 The at least substantially permanent bond may be provided by removable adhesion, whereby the dry color component may be removed from the surface without destruction of the sheet of dry color component. Alternatively, the substantially permanent bond may be provided by latent permanent adhesion, whereby the sheet of dry color component may not be removed without destruction of the sheet.

25 In one embodiment, the adhesive is a pressure activated adhesive wherein the adhesive tack is lower at low application pressures, thereby allowing initial repositioning of the sheet of dry color component on a surface without damaging the sheet of dry color component, but upon application of higher pressure, the adhesive exhibits greater tack whereby a more permanent bond is formed between the sheet of dry color component and

30 the surface to which it is applied, whereby the sheet of dry color component is substantially permanently attached to the surface, i.e., the sheet does not spontaneously

separate and is not removed upon casual contact, light washing or the like. Various pressure sensitive adhesives are known in the art and may be used in the articles of the present invention. Such pressure sensitive adhesives may be provided at a low coating weight or in a patterned or textured manner in order to allow repositioning while  
5 providing latent permanent adhesion.

Examples of pressure sensitive adhesives include adhesives containing microspheres, employed in one, two or more layers. Such microspheres can be, for example, breakable or deformable upon application of force to the adhesive or article. Compositions containing breakable or deformable microspheres are described, for  
10 example, in the Erwin U.S. Patent No. 3,314,838 and the Danielson et al U.S. Patent No. 3,331,729. Adhesives containing microspheres are commercially available, one example of which is available under the tradename Controltac® from 3M Company. Pressure sensitive adhesives are also disclosed, for example, in the Questel et al U.S. Patent No. 6,020,062. Additional formulations for pressure-sensitive adhesive compositions are  
15 disclosed in the Blackwell U.S. Patent No. 5,073,457 and the Sagoff et al U.S. Patent No. 4,151,319, which adhesives provide repositioning and latent permanent adhesion, and the Reaves et al U.S. Patent No. 5,939,479, disclosing an adhesive which provides repositioning adhesion. Additional pressure-sensitive adhesives are commercially available and include Fasson® 2001, a latent permanent adhesion product commercially  
20 available from Avery Dennison.

The tack of the adhesive may also be varied as described above by application of a blocking agent on the exposed surface of the adhesive. The blocking agent has the effect of lowering the initial tack of the adhesive at the exposed surface of the adhesive. Thus, the blocking agent as defined herein lowers the low pressure tack of an adhesive while  
25 permitting high tack to be achieved with the application of higher pressure which displaces the blocking agent. Suitable blocking agents can be solid structures that cover at least a portion of the surface and extend over the outer surface of the adhesive. The blocking agents may form a plurality of discrete structures or may form an interconnected network. One of ordinary skill in the art will recognize various suitable blocking agents  
30 for use in such an embodiment.

In one embodiment, the blocking agent may comprise compositions containing repositionable microspheres. Such compositions may be provided in one or more layers as described in the Parrotta U.S. Patent No. 4,376,151. Examples of additional blocking agents include, but are not limited to, those disclosed in the Ochi U.S. Patent No. 4,556,595, clusters, powders or particles of, for example, starch, including but not limited to potato starch or corn starch, talc, silicon dioxide, titanium dioxide, zeolite, or other minerals, polymers or polymer prills, glass or ceramic beads, or the like. The amount and size of such materials will depend on the type and tack of individual adhesives. In one example, talc particles having an average particle size of about 0.1 mm are applied in an amount of about 2 to about 6 g/m<sup>2</sup> to sufficiently reduce initial tack to allow repositioning without a proportionate decrease in final tack. In another example, silicon dioxide particles having an average particle size of about 25 nm are applied in an amount of from about 1 to about 3 g/m<sup>2</sup>. In yet another example, titanium dioxide particles having an average particle size of about 50 nm and are applied in an amount of from about 1 to about 3 g/m<sup>2</sup>. The blocking agent may be applied in a uniform or nonuniform pattern as desired.

In one embodiment of the articles of the invention, the sheet of dry colorant is permanently adhered to the surface such that it may not be removed without damaging the sheet of dry color component. In a further embodiment of the articles of the invention, the sheet of dry colorant is permanently adhered to the surface such that it cannot be removed by casual contact, washing or the like, but it may be removed without substantial destruction of the sheet.

In one embodiment, the sheet 12 of dry color component may further include a release agent coating at its outer surface 15, i.e., on the surface of the sheet 12 which is opposite, i.e., not adjacent, the adhesive 14 as shown in Fig. 1. Suitable release agents are discussed in detail below. Alternatively, or in addition, the sheet 12 of dry color component may include a top or outer, exposed film or coating at its surface, hereinafter a "topcoat." The topcoat may comprise a transparent, translucent, pearlescent, opaque or other formulation as necessary to provide a desired optical effect, and/or to provide the sheet of dry color component with increased protection, stiffness and/or structural support. For example, the topcoat may be employed to provide a desired sheen to the dry

color component, i.e., flat, satin, eggshell, semi-gloss or gloss, to increase the opacity, diffusion or reflectance of the dry color component upon application to a surface, or the like. In further embodiments, the topcoat may include one or more additional components which provide the sheet of dry color component with improved durability, chip resistance, washability, stain repellence, fade resistance, including ultraviolet light  
5 fade resistance, fluorescence, phosphorescence, bactericidal properties, fragrance, odor removal, non-permanent writability (allowing erasure or washing to remove), noise and/or heat insulation, conductivity, static dissipation, and/or environmental interaction, for example allowing shade or color change based on temperature or the like.

10 The topcoat is provided at the outer surface of the sheet 12 and may be permanently or temporarily adhered to the underlying layer. Fig. 1B shows an article 10B comprising a sheet 12B of dry color component and an adhesive 14B. The sheet 12B includes a layer 13B of dry color component and a topcoat 17. The topcoat 17 may similarly be provided with a release agent coating at its outer surface 19. The topcoat  
15 may be formed of any suitable material, examples of which include polymers, for example polyurethanes, polyvinyl chlorides, polyvinylidene fluorides, polyacrylates, cellulosic materials and the like, as well as blends thereof, and optionally various particles for altering optical effects or texture of the surface of the dry color component sheet. Specific examples of topcoats include polyurethane and blends of polyacrylate and  
20 polyvinylidene chloride. The topcoat can be transparent. In other embodiments, the topcoat can be translucent, or at least partially opaque. Other topcoat materials suitable for use herein will be apparent to those of ordinary skill in the art.

In one embodiment, the topcoat is configured, either microscopically or macroscopically, to allow the sheet of dry color component and adhesive to provide a  
25 surface covering with a desired WVTR, for example greater than  $1 \text{ g-}\mu\text{m}^2/24 \text{ hrs}$ , at 100% relative humidity and  $40^\circ\text{C}$ , as measured according to ASTM F1249-90. The topcoat may, for example, be provided with perforations, pores, orifices or the like, or may be formed of a material exhibiting such WVTR. In one embodiment, the topcoat is formed of a polymeric coating such as, but not limited to, polyurethane coating, having a  
30 sufficiently small thickness, for example, of about 0.5 mils (0.013 mm) or less, and in a further embodiment, of about 0.25 mils (0.007 mm) or less, to allow the desired WVTR.

Fig. 2 sets forth a schematic diagram of another embodiment of an article for applying color on a surface according to the invention. The article 20 includes a sheet 22 of dry color component, an adhesive 24 on the surface 26 of the sheet of dry color component and a releasable liner 28. The sheet 22 of dry color component is arranged between the releasable liner 28 and the adhesive 24. The releasable liner 28 may be included in order to provide structural support and/or strength to the sheet 22 of dry color component, for example when the releasable liner is in film form, and/or to facilitate handling of the article during manufacture, storage and use. The releasable liner is adapted for removal from the sheet of dry color component prior to or upon application of the sheet of dry color component to a surface to be colored. Typically, the releasable liner will be removed from the sheet of dry paint by peeling therefrom. As shown in Fig. 2, the releasable liner may be provided with a tab 32 which extends beyond the sheet of dry color component to assist peeling of the liner 28 from the sheet 22 of dry color component. Alternatively, the release liner may be removed using an adhesive tape that may be applied to the corner (or other edge) of the release liner and then pulled off, for example, after the sheet of dry colorant has been applied to a surface. The adhesive tape pulls the release liner off the sheet of dry colorant, leaving the sheet of dry colorant attached to the surface. The adhesive tape does not damage the surface of the sheet of dry colorant or adjacent sheets of dry colorant. An example of a suitable adhesive tape is Temp RL™ tape commercially available from Saint Gobain. In a further embodiment, the articles may be adapted for use with a simple separator tool which facilitates separation of the releasable liner from the sheet of dry colorant. Such a tool may be provided with at least one straight edge which acts to separate the releasable liner at an edge of the article.

In one embodiment, the articles of the invention include a releasable liner adjacent the sheet of dry color component and, in the planar configuration of the articles as shown in Fig. 2, are free of a releasable liner on the adhesive. Thus, in the embodiment of Fig. 2, the upper surface of the adhesive 24 is free of a releasable liner when the article is in a planar, nonrolled configuration. When an article as shown in Fig. 2 is in a roll form, the releasable liner 28 will be positioned adjacent, and possibly contacting, the exposed

adhesive 24 and therefore may provide a release surface to allow unrolling of the article without interference of the adhesive, as is described in greater detail below.

In further embodiments, the articles may comprise two or more releasable liners. For example, the article 20A of Fig. 2A comprises a sheet 22A of dry color component, including layer 23 of dry color component and topcoat layer 27, and an adhesive 24A, in combination with a releasable liner 28A on the surface of the sheet 22A of dry color component which is opposite that of the adhesive 24A, and a releasable liner 36 on the adhesive 24A. The topcoat layer 27 on the sheet 22A of dry color component may provide the color component with additional properties as discussed above, between the sheet 22A and the releasable liner 28A.

The releasable liner may be formed of any material which provides the desired structural support or strength to the sheet of dry color component to facilitate manufacture, handling and/or application of the article to a desired surface. Typically, the releasable liner will have a combination of basis weight, thickness and rigidity to provide the desired structural support and/or strength to the article. For example, the releasable liner may be formed of a polymer material, for example as a thin polymeric film, as a woven sheet, or as a non-woven sheet, or of a fibrous ligno-cellulosic material such as paper. In one embodiment, the releasable liner comprises a polymer film. Conveniently, the sheet of dry color component may be formed on the polymer film, for example by coating or printing the color component directly on the polymer film surface. The release surface may be relatively flat and smooth but may also be textured or three dimensionally configured via embossing, microembossing, thermoforming with heat and pressure, vacuum forming, or other approaches known to those skilled in the art.

In one embodiment, the releasable liner is formed of a material which is inherently releasable from the sheet of dry color component. Suitable materials which may be used to form an inherently releasable liner include, but are not limited to, silicone-based polymers, including copolymers thereof, fluorocarbon polymers, including copolymers thereof, fluoro-acrylate polymers, including copolymers thereof, and polymers, including copolymers, which include a release additive, for example a silicone or fluorocarbon additive, therein. Examples of polymers containing such additives include polyolefins, for example, polyethylene homopolymers and copolymers, polypropylene homopolymers

and copolymers and polymethyl pentene homopolymers and copolymers, polystyrene homopolymers and copolymers, polyester homopolymers and copolymers, for example polyethylene terephthalates (PET), and polyamide homopolymers and copolymers, including one or more release additives such as silicone oils, silicone surfactants, silicone homopolymers and copolymers, fluorocarbon oils, fluorocarbon surfactants, fluorocarbon homopolymers and copolymers, for example fluoro-acrylate homopolymers and copolymers, and mixtures thereof. Suitable release additives may alone be liquid or solid at room temperature. Suitable release additives may be liquid or solid at room temperature. U.S. Patents Nos. 5,476,901 and 5,641,835, each of which is incorporated herein by reference, disclose examples of suitable silicone-polyolefin copolymers suitable for use in forming a releasable liner in the articles of the present invention. U.S. Patent No. 5,728,469, incorporated herein by reference, discloses additional suitable block copolymer release materials for pressure sensitive adhesives. European Patent Application EP 1 018 533 A2, incorporated herein by reference, further discloses silicone-containing resin suitable for use as a release layer.

Alternatively, or in addition, a release agent may be provided between the releasable liner and the sheet of dry color component in order to assist removal of the releasable liner from the sheet of dry color component. For example, in the article of Fig. 2, the release agent is provided at interface 30 between the sheet 22 of dry color component and the releasable liner 28. The release agent may be provided as a coating or as a separate film layer in the article. In a specific embodiment, the release agent is provided as a coating on one or both of the interface surfaces between the sheet of dry color component and the releasable liner. Various release agents are known in the art and are suitable for use herein and include, but are not limited to, silicone oil, silicone surfactant, silicone homopolymer or copolymer, fluorocarbon oil, fluorocarbon surfactant, fluorocarbon homopolymer or copolymer, for example fluoro-acrylate homopolymers and copolymers, and mixtures thereof. The release agent may be provided as a coating on the surface of the dry sheet of color component at the interface 30 adjacent the releasable liner, as a coating on the releasable liner surface of at the interface 30 adjacent sheet of dry color component, as a layer between the sheet of dry color component and the releasable liner, or any combination thereof. Such coatings may be continuous or non-



continuous as is necessary in order for the liner to be releasable from the sheet of dry color component without damage to the surface of the sheet of dry color component. In one embodiment, the release agent comprises a polymeric material, for example a polysilicone, which is applied as a continuous or non-continuous coating on the surface of the releasable liner 28 at the interface 30.

In one embodiment, the releasable liner may further include a release agent at its outer surface 34, i.e., on the surface of the liner which is opposite, i.e., not adjacent, the sheet of dry color component. In the embodiment of the article of Fig 2 wherein the releasable liner 28 is provided with a release agent on the surface 34 which is opposite to the sheet of dry color component, the release agent on surface 34 prevents the surface 34 from adhering to the adhesive 24 during storage, handling and use of the article. For example, the provision of a release agent on surface 34 facilitates storage of the article in a rolled manner. Similarly, in the embodiment of Fig. 1, the surface 15 of the sheet 12 of dry color component may be provided with a release agent to prevent adhesion of the surface 15 with adhesive 14 during storage, handling and use of the article 10. Release agents of the type discussed above are suitable for application to surface 15 or surface 34.

In the embodiment of Fig. 2, the adhesive 14 may include a blocking agent of the type discussed above, wherein the blocking agent renders the adhesive pressure activatable, whereby the adhesive tack is reduced at low application pressures to allow initial repositioning of the article on a surface to be colored, while upon application of higher pressure, the adhesive permanently bonds the sheet of dry color component to the surface.

In an alternate embodiment, the releasable liner 28 is arranged on the surface of the sheet 22 of dry color component at interface 30 without any additional layer, coating or component therebetween. In this embodiment, the releasable liner 28 is preferably formed of a material which inherently releases from the surface of the sheet 22 of dry color component at the interface 30. This embodiment eliminates any residue of release agent on the surface of the sheet 22 of dry color component once the releasable liner 28 is removed therefrom.

Fig. 3 sets forth a schematic diagram of yet another embodiment of an article for applying color on a surface according to the invention. The article 40 includes a sheet 42

of dry color component, including a layer 43 of dry color component and a backing layer 45 on one surface 46 of the layer 43 of dry color component. An adhesive 44 is provided on the surface 47 of the backing layer 45. The article comprising the sheet 42 and the adhesive 44 has a thickness of about 3 mils (0.08 mm) or less, more specifically about 2 mils (0.05 mm) or less, and even more specifically about 1 mil (0.3 mm) or less. Thus, the article of this embodiment is significantly thinner than conventional wallpaper products which typically have significantly thicker carrier substrates. The backing layer 45 may be included, for example, in order to provide structural support and/or strength to the sheet 42 of dry color component, to provide additional opacifying, whitening or color strengthening effects, and/or to facilitate handling of the article during storage and use. The backing layer may be formed of any suitable thin material, examples of which include, but are not limited to, paper and other cellulosic materials, polymer films and woven or nonwoven fabrics, textile fabrics, glass or ceramic fabrics, metallized layer(s), and the like. In one embodiment, the backing layer may provide increased opacity to the article upon application to a surface to be colored. For example, the backing layer may include titanium dioxide, metal filler or the like to provide increased opacity. Preferably, the backing layer will exhibit sufficient flexibility to allow bending, rolling and other similar manipulations of the article.

In one embodiment, the backing layer comprises a metallized film, i.e., a laminate of two or more polymer films having a metallized layer or coating between two internal surfaces thereof. As shown in Fig. 3, the backing layer 45 may comprise a laminate of two polymer films 50, 52, for example formed of polyethylene terephthalate, having a metallized coating 54, for example formed of silver ink, a metal oxide, aluminum, stainless steel or the like, therebetween. One example of an aluminum ink is Metalure®, commercially available from Eckart America Division (Painesville, Ohio, USA) of Eckart Werke GmbH and Company (manufactured by Avery Dennison Corp.). The metallized coating may be continuous or discontinuous, and patterned or nonpatterned as desired. Preferably, polymer film 52 is very thin and may comprise a tie layer or coating to the sheet of dry color component. The polymer film 50 may provide a surface for the metallized coating 54 and may provide structural support to the article. In one embodiment, the sheet 42 of dry color component may further include a release agent

coating at its outer surface, i.e., on the surface of the sheet 42 which is opposite, i.e., not adjacent to, the surface including the backing layer 45. In yet another embodiment, one of the layers of polymer film 50 or 52 may be eliminated providing an article that is even thinner, yet remains opaque.

5           The size of the articles according to the present invention by width and length may vary in accordance with the dimensions of surfaces to be colored. For example, the articles may be provided in relatively large lengths suitable for coloring an entire length or multiple lengths of an interior architectural surface. Sheets of such lengths may be stored in roll form. Alternatively, the articles may be provided in smaller sheets, for  
10   example in tile size to accommodate small areas. Similarly, articles may be provided in strip or smaller sized form for use in areas of smaller dimensions, for example, as trim around moldings, borders, accent pieces (e.g., stencils), outlets, corners and areas adjacent to surfaces which are not intended for color application. Smaller sized articles may also be convenient for repairing damaged areas.

15           The articles according to the present invention allow one to apply color on a surface by delivering dry color component to the surface. More specifically, the articles allow one to provide a substantially permanent color effect on a surface. Advantageously, the dry color component is delivered to the surface without the use of wet tools for delivering the color component, for example without the use of wet paint  
20   applicators, such as paint brushes, paint sprayers or paint rollers, or paint trays, without the use of mess protection such as taping or drop cloths, without the use of color component cleaning materials commonly required for washing paint applicators, and/or without the use of liquid volatile organic component vehicles such as oil-based solvents for the color component. As a result, a color effect may be obtained more quickly and  
25   easily, while avoiding many problems associated with wet application as discussed herein.

          Thus, in one embodiment of the present methods, an article comprising a dry color component is applied to an architectural surface. After application and upon removal of any releasable liners included in the article, the remaining portion of the article, for  
30   example the dry color component and any adhering means, i.e., adhesive, has a thickness of about 3 mils or less.

In a preferred embodiment of the present methods, the dry color component is delivered to the surface in the form of a sheet of dry color component as discussed above. Preferably, the sheet of dry color component has an adhesive on one surface thereof. The methods according to the invention may further comprise the step of initially adhering the delivered dry color component to the surface, for example by exerting light pressure on the sheet of dry color component to temporarily bond the sheet of dry color component to the surface to be colored, optionally adjusting the position or alignment of the sheet, and exerting increased pressure on the sheet of dry color component to permanently bond the sheet of dry color component to the surface to be colored. For example, when the sheet of dry color component is provided in an article 10 as described in Fig. 1, pressure may be applied to surface 15 of the article to adhere the adhesive 14 to a surface to be colored. In the article 20 of Fig. 2, pressure is applied to surface 34 as adhesive 24 contacts the surface to be colored in order to adhere the article 20 including the sheet 22 of dry color component to a surface to be colored.

15 The articles of the invention may be applied to a surface merely by hand placement or with the use of a simple applicator, for example a wall paper roller, and/or dispenser, or other tool. Similarly, any pressure required for adhesion of the articles may be applied by hand or with a tool. Such pressure may be applied in a single pass or by two or more passes over the article.

20 The articles and methods according to the invention provide improved means for providing color to a surface, for example an architectural surface such as an interior wall, and avoid many of the disadvantages associated with conventional wet painting and wall papering. The risk of paint spills and splatters and the risk of painting undesirable surfaces is eliminated as the dry color component such as paint is immobilized or contained prior to and during application. Thus, taping, drop cloths and other protective measures commonly employed for floors, furniture and adjacent areas are not required. Additionally, the articles and methods allow the coloring to be achieved in increments of time and do not require a continuous large block of time to perform. Similarly, application may be interrupted without inconvenience. Further, since the color component is immobilized or contained in the articles according to the invention, the overall amount of color component needed to achieve a desired result is reduced as

compared with conventional wet painting wherein various collateral surfaces of applicators, protective tapes, drop cloths and the like receive excess paint. Moreover, since the articles may be repositioned prior to permanent bonding, precise location is allowed, and, since the articles are substantially free of liquid carriers, shrinking of the sheets after application, as commonly occurs with wallpapers, is avoided. Thus, edge matching of adjacent sheets may be easily obtained. Alternatively, edge matching issues may be avoided merely by overlapping adjacent sheets.

In view of the above, it will be apparent that the articles according to the present invention may be formed by a variety of methods and techniques. One such method is disclosed herein for illustrative purposes only. More particularly, with reference to Fig. 4, a small, laboratory scale, semi-automated process is shown. A releasable liner 100 is provided in roll form and is unrolled to travel through assembly 102 via rollers 104, 106, 108, 110, 112 and 114 to form a completed article 116 which is wound on roll 118. As will be described in further detail below, trimmed portions 120 are directed to roll 122.

The releasable liner 100 is pulled as a web 101 through the assembly by a combination of the rolls 118 and 122 and a conveyer 124, for example a vacuum conveyer. A suitable vacuum conveyor may comprise a continuous conveyor belt with two pulleys having an array of spaced holes that are exposed to the vacuum chamber immediately below. Negative pressure (vacuum) is created by a forced air blower. As the belt passes over the chamber, a negative pressure is created at each hole such that the releasable liner 100 is securely held to the belt as it passes over the belt. This effect assists in preventing wrinkles in the releasable liner 100 as the applied color component dries. The vacuum conveyor belt speed may be matched to that of the drive rolls 118 and 122 driven by a drive 119. The shaft of a roller 126 from which the releasable liner 100 is supplied is connected with a friction clutch 128 which may be adjusted to obtain sufficient tension in the web 101 for smooth travel through the process. A Fife guiding unit 130 may be provided to track the web travel through the assembly.

A color component such as wet paint is applied to the web 101 of the releasable liner adjacent roller 106 using an applicator 132. The paint or other color component may be water-based or solvent-based as desired. In one embodiment, the applicator 132 comprises a #50 wire wound rod which may be held against the roller 106 by spring

tension or the like such that the web 101 passes between the roller 106 and the applicator 132. The color component such as paint is introduced at the upstream side of the wire wound rod applicator 132 by a manifold 134. The manifold is fed by tubing 136 from a peristaltic pump 138 which draws the wet paint from a reservoir 140. To form the sheet of dry color component, the paint is dried on the web 101, for example as it passes over the vacuum conveyor 124 by the use of dryers. In the embodiment of Fig. 4, the dryers comprise two infrared heaters 142 which are aided by a forced ambient air duct 144. The air duct 144 may conveniently blow the exhaust from the vacuum conveyor 124. One skilled in the art will readily appreciate that solvent or other carrier removed during the drying process may be captured and recycled as desired. A sheet of dry color component is thus formed on the releasable liner web.

An adhesive is then applied to the sheet of dry color component on the surface opposite the releasable liner. For example, in the assembly 102 of Fig. 4, adhesive is applied to the surface of the sheet of dry color component on the web 101 at roller 108 by an applicator 148 which may comprise, for example, a #20 wire wound rod. The wire wound rod applicator 148 may be held against the roller 108 by spring tension or the like such that the web 101 passes between the roller and the applicator. Liquid adhesive is introduced at the upstream side of the wire wound rod applicator 148 by a manifold 146. The manifold 146 is fed by tubing 150 from a peristaltic pump 152 which draws the liquid adhesive from a reservoir 154. The liquid adhesive in a reservoir 154 is continuously stirred by a mixer 156. With the adhesive applied thereon, the web 101 travels to an oscillating fabric covered roller 158 which traverses back and forth in the machine direction above a slider plate 160 to impart a texture to the liquid adhesive applied to the sheet of dry color component on the web 101. A textured adhesive may allow the article to be more easily repositioned prior to permanent bonding. The adhesive is then dried, for example, by passing the web 101 under an infrared heater 162 at roller 110.

In a preferred embodiment, the web 101 travels through rollers 112 and 114, one of which is preferably in the form of a rotary cutting knife. In a more specific embodiment, roller 114 comprises two rotary cutting knives which are arranged adjacent the edges of the web in order to trim the web edges and provide the final article with the

homogenous edges. In another embodiment, the roller 114 comprises a plurality of rotary cutting knife sets which are arranged so as to cut the web into two or more strips to provide smaller sized articles adapted for applying color to smaller sized areas as discussed above. The resulting article 116 is then wound on the roll 118 while the  
5 trimmed edges 120 are wound on the roll 122. As set forth above, the described assembly 102 and preparation process is illustrative only and variations thereof will be apparent to those skilled in the art. For example, release agents in the form of coatings, layers or the like may be provided in the process. Additionally, the sheet of dry color component may be provided in the final article in the absence of a release liner. For example, the sheet of  
10 dry color component may be formed on a processing web or forming belt and then separated from the processing web or forming belt prior to storage in roll or sheet form.

In an alternate embodiment, the articles according to the invention as set forth, for example, in Fig. 2A may be formed using a modified version of the process as described above wherein two releasable liner webs are employed. For example, with reference to  
15 Fig. 2A, a topcoat composition for forming topcoat layer 27 may be applied to a releasable liner web by reverse roll, extrusion coating or the like techniques, and dried thereon, for example with heat. A color component may then be applied to the dried topcoat layer, for example by reverse roll, gravure coating, printing, or the like techniques, and dried with heat. The adhesive may then be applied to a second releasable  
20 liner web, followed by laminating the releasable liner-topcoat-dry color component member with the adhesive-releasable liner member, with the dry color component and adhesive in facing relationship. Heat may be provided throughout this process by any suitable means including convection or radiation, for example infrared, ultraviolet or the like. One of ordinary skill in the art will also appreciate that this method may be used to  
25 provide an article including a single releasable liner, for example as set forth in Fig. 2, by merely removing the second releasable liner from the adhesive once the releasable liner-topcoat-dry color component member and the adhesive-releasable liner member have been assembled.

Additional or alternative apparatus and/or processing steps will be apparent to one  
30 skilled in the art in view of this description and are within the scope of the present invention. For example, the color component or adhesive could be applied as a single

layer or in multiple layers using a variety of known application techniques including extrusion, spraying, printing, reverse roll, gravure coating, roll application and others known in the art. The layers may have the same properties or various layers, different from each other, may be employed to combine various properties such as color, strength, 5 opacity, and the like. A blocking agent as described above may be applied to the adhesive surface and/or may be mixed with the adhesive. Heating may be provided by infrared, convection, or radiation apparatus or other techniques known in the art. Texturization may be provided on or in one or more layers of the article.

The specific illustrations and embodiments described herein are exemplary only in 10 nature and are not intended to be limiting of the invention defined by the claims. Further embodiments and examples will be apparent to one of ordinary skill in the art in view of this specification and are within the scope of the claimed invention.



## WHAT IS CLAIMED IS:

1. An article for applying color on a surface, characterized by a sheet of dry architectural surface color component, an adhesive on one surface of the sheet of dry color component, and a releasable liner, wherein the sheet of dry color component is arranged between the releasable liner and the adhesive; optionally wherein the adhesive is adapted to adhere the article to a surface upon application of a pressure of less than 50 lbs/in<sup>2</sup>; optionally wherein the article exhibits an elongation of less than 50%; and optionally wherein said color is removable.
2. The article according to claim 1, further characterized by an opacifying agent; optionally wherein said opacifying agent is in the adhesive.
3. The article according to claim 1, wherein a release agent is provided between the releasable liner and the sheet of dry color component.
4. The article according to claim 1, wherein the releasable liner is characterized by comprising a polymer film; optionally wherein said polymer film is characterized by comprising a release constituent selected from: release agents, release additives and combinations thereof.
5. The article according to claim 1, wherein said sheet of dry color component is characterized by a dry color component layer comprising (i) pigment, dye and combinations thereof, and (ii) binder.
6. The article according to claim 1, wherein a polymeric release agent is provided between the releasable liner and the sheet of dry color component.
7. The article according to claim 1, wherein a surface of the releasable liner opposite the sheet of dry color component has a release agent thereon.
8. The article according to claim 1, wherein, when the article is in a planar, non-rolled configuration, said article is free of a releasable liner on the adhesive.

9. An article for applying color on a surface, characterized by a sheet of dry color component, an adhesive on one surface of the sheet of dry color component, and a releasable liner; preferably wherein the sheet of dry color component is arranged between the releasable liner and the adhesive; preferably wherein the adhesive is adapted to exhibit an initial tack in response to a first condition and a subsequent tack greater than the initial tack in response to a second condition; and preferably wherein the subsequent tack is adapted to provide a substantially permanent bond of the sheet of dry color component to a surface.

10. The article according to claim 9, wherein a surface of the releasable liner opposite the sheet of dry color component is characterized by comprising a release agent thereon.

11. The article according to claim 9 wherein the adhesive is adapted to exhibit the initial tack upon application of a first pressure and the subsequent tack upon application of a second pressure; wherein said second pressure is greater than said first pressure; preferably wherein the adhesive is characterized by a pressure sensitive adhesive.

12. The article according to claim 11 wherein the adhesive is provided with a blocking agent at a surface thereof; preferably wherein said blocking agent is selected from: starch, talc, silicon dioxide, titanium dioxide, zeolite, polymers, glass, ceramic and mixtures thereof.

13. The article according to claim 9 wherein the first condition is characterized by a first period of time after application of the article to a surface, and the second condition occurs after the first period of time.

14. The article according to claim 13 wherein the first period commences following the application of said article to said surface and optionally wherein said first period ends less than 24 hours after commencement of said first period.

15. The article according to claim 9, further characterized by an opacifying agent; optionally wherein the opacifying agent is in the adhesive.

16. The article according to claim 9, wherein a release agent is provided between the releasable liner and the sheet of dry color component.

17. The article according to claim 9, wherein the adhesive is adapted to adhere the article to a surface at room temperature and upon application of a pressure of less than 50 lb/in<sup>2</sup>.

18. The article according to claim 9, wherein the article exhibits an elongation of less than 50%.

19. The article according to claim 9, wherein the sheet of dry color component is characterized by an opacifying layer; optionally wherein the opacifying layer is a film having a layer on at least one of its surfaces; preferably wherein said film is selected from: polymeric films, metallic films, fibrous films and combinations thereof.

20. The article according to claim 9, wherein the sheet of dry color component is characterized by comprising a reinforcing component therein; optionally wherein said reinforcing component is characterized by comprising filaments, fibers, scrim, threads, a sheet and combinations thereof.

21. The article according to claim 9, wherein the sheet of dry color component is characterized by a topcoat on a surface opposite the adhesive; optionally wherein said topcoat comprises a protective film layer.

22. An article for applying color on a surface, characterized by a sheet of dry color component and an adhesive on one surface of the sheet of dry color component, optionally wherein the sheet of dry color component and the adhesive are adapted to provide a surface covering having a water vapor transmission rate of at least 1 g/μm/cm<sup>2</sup>/24 hrs.

23. The article according to claim 22, wherein said article is characterized by comprising a releasable liner and wherein the sheet of dry color component is arranged between the releasable liner and the adhesive.

24. The article according to claim 23, wherein said article is free of a releasable liner on the adhesive.

25. The article according to claim 22, wherein the sheet of dry color component is characterized by comprising a topcoat layer.

26. An article for applying color on a surface, characterized by a sheet of dry color component and an adhesive on one surface of the sheet of dry color component; optionally wherein the sheet of dry color component exhibits a specular reflectance of less than 60 gloss units at 60°.

27. The article according to claim 26, further characterized by comprising a releasable liner; optionally wherein said sheet of dry color component is arranged between the releasable liner and the adhesive.

28. The article according to claim 27, wherein the article is free of a releasable liner on the adhesive.

29. A method for providing a substantially permanent color effect on an architectural surface, characterized by comprising the step of delivering an article according to claim 1, claim 9, claim 22 or claim 26 to the architectural surface.

30. The method according to claim 29, wherein the sheet of dry color component is applied to the architectural surface without the use of wet tools for delivering the article or applying the color component, mess protection, or color component cleaning materials; preferably wherein the dry color component is substantially free of volatile organic components; and optionally wherein said wet tools are selected from the group consisting of wet brushes, wet sprayers, wet rollers and combinations thereof.

31. The method according to claim 30, wherein the sheet of dry color component is adhered to the architectural surface by application of pressure to a surface of the releasable liner opposite the sheet of dry color component.

32. The method according to claim 29, wherein the dry color component is characterized by comprising a dry color component layer comprising (i) pigment, dye and combinations thereof, and (ii) a binder.

33. The method according to claim 29, wherein said adhesive is adapted to exhibit an initial tack in response to a first condition and a subsequent tack greater than the initial tack in response to a second condition.

1/3

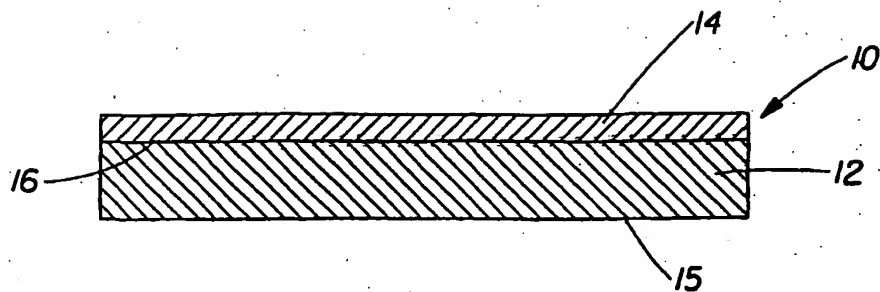


Fig. 1

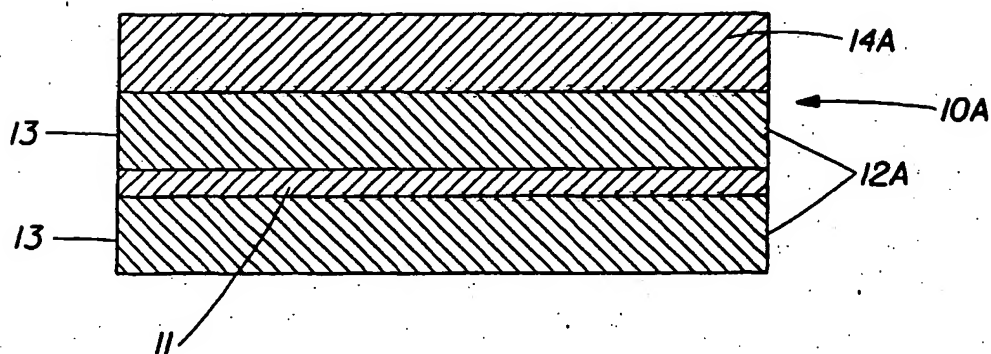


Fig. 1A

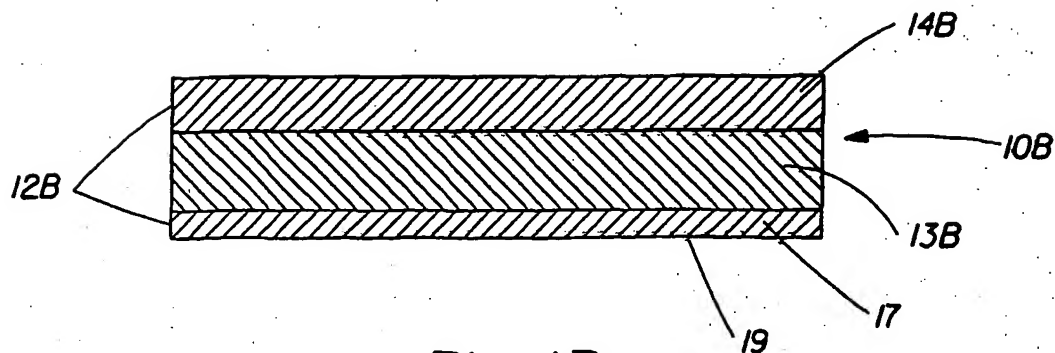
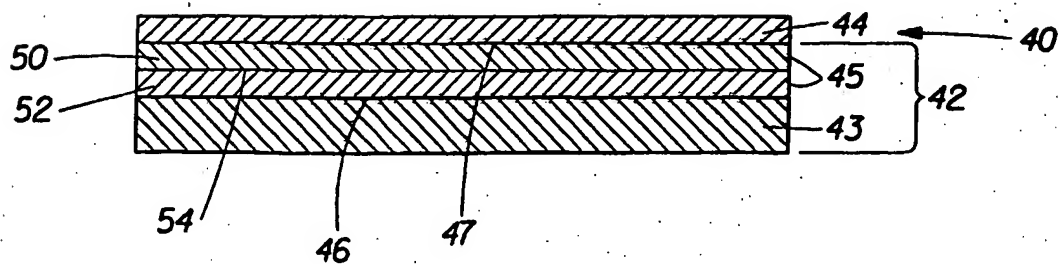
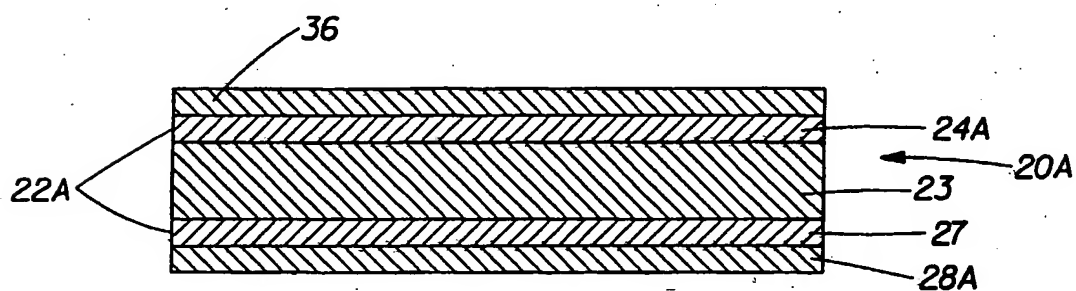
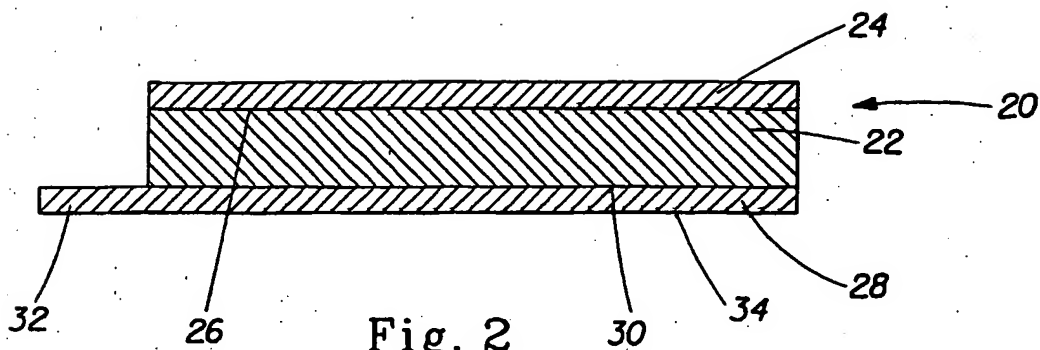


Fig. 1B

2/3



3/3

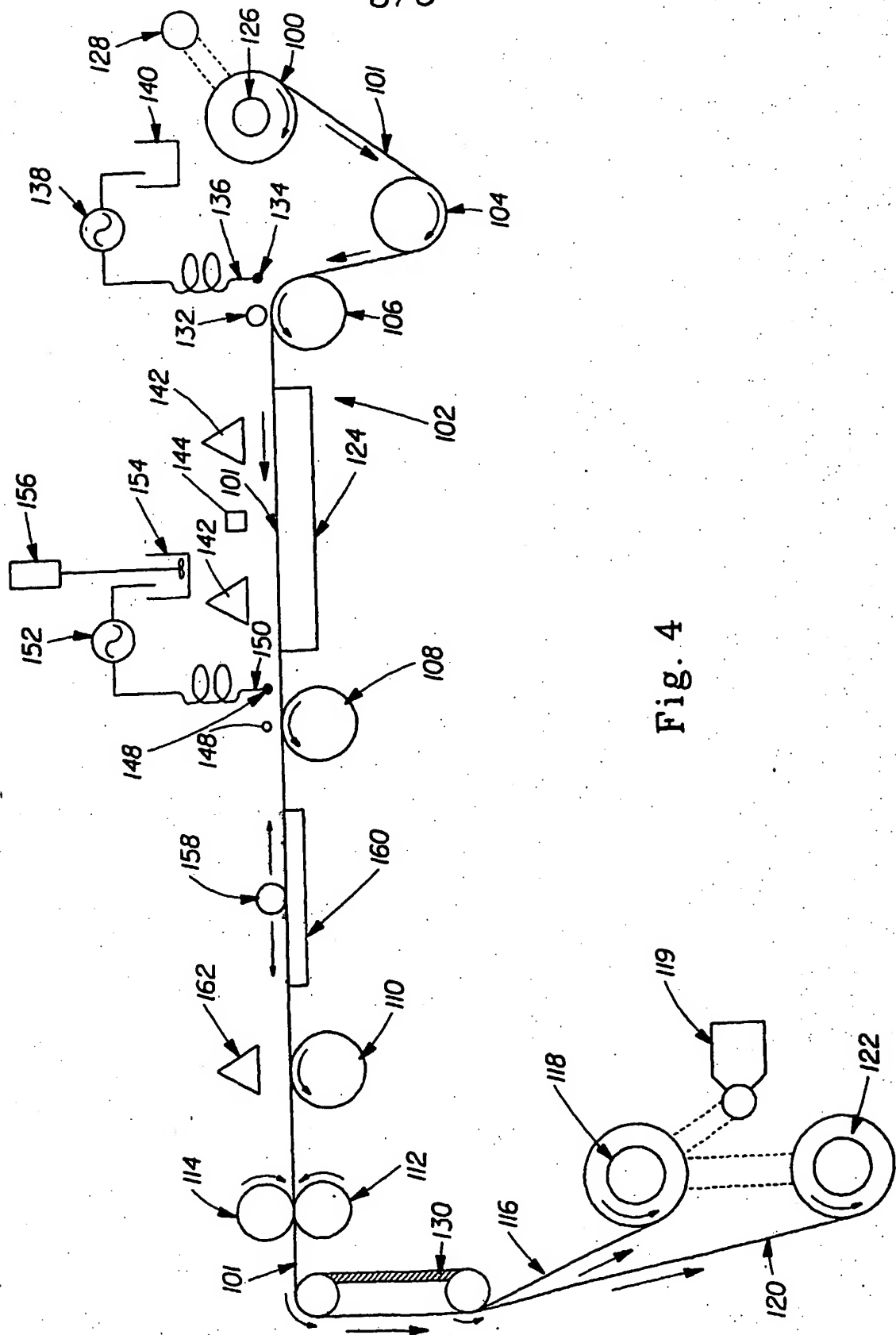


Fig. 4



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- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 03/053719 A3

(54) Title: ARTICLES AND METHODS FOR APPLYING COLOR ON SURFACES

(57) Abstract: Articles for applying color on a surface comprise a sheet of dry color component and an adhesive on one surface of the sheet of dry color component. The article further includes a releasable liner, and the sheet of dry color component is arranged between the releasable liner and the adhesive. Methods for providing a substantially permanent color effect on an architectural surface comprise delivering such an article to the architectural surface.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/40946

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 B44C1/10 C09J7/02 B32B27/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 B44C C09J B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 35 43 777 A (HAMMEL GEB MESSEMER CHRISTEL) 19 June 1987 (1987-06-19) claim 1 figures	1-21, 29-33
X	EP 1 055 514 A (ROTOPLAST S R L) 29 November 2000 (2000-11-29) claims 1,10	1-21, 29-33
X	US 3 640 791 A (ROSENHEIM RICHARD) 8 February 1972 (1972-02-08) claim 1	1-21, 29-33

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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17 April 2003

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 02/40946

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-21 (complete), 29-33 (in part)

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PT/US 02/40946

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3543777 A	19-06-1987	NONE	
EP 1055514 A	29-11-2000	IT LU990012 A AT 237469 T DE 60002123 D	24-11-2000 15-05-2003 22-05-2003
US 3640791 A	08-02-1972	NONE	